Phosphorus is naturally released into our environment through the weathering of geologic materials. However, through the use of phosphorus rich products such as fertilizers and detergents we have accelerated the rate at which phosphorus is released.

Excessive phosphorus in our environment is a major cause of freshwater water quality problems, including eutrophication.

"Low Impact Development" designs such as rain gardens and bioretention systems are considered viable options to reduce many of the detrimental effects caused by stormwater, but unfortunately many of the LID designs rely on a bioretention soil mix (BSM) which contains a phosphorus rich material. When stormwater enters these designs many of the contaminants of concern are removed. However often effluent phosphorus levels are elevated.

**Introduction**

**WTR Preparation**

The WTR media when collected from drinking water facilities comes as a sludge.

The WTR performs best in terms of phosphorus sorption and infiltration when dried and sieved to a particle size range between 2-5 mm before being used in a stormwater filter

**Testing Methods**

- **38 WTR Mixes Designed and Tested**
  - Various percentages of WTR, C-33 Mound Sand, Medium Sand, 3/8" Crushed Gravel, Pea Gravel

- **Infiltration Rates**
  - Trying to balance both infiltration and Phosphorus sorption
  - Constant Head Method
  - Darcy’s Law \( K = \frac{Q}{A \cdot H} \)

- **Equilibrium Sorption**
  - Used to determine the life span of media
  - Batch Testing
  - Freundlich Isotherm

- **Kinetic Sorption**
  - Determines contact time needed to sorb phosphorus

- **Dissolved Metals**
  - Al, Ag, As, Cd, Cu, Cr, Ni, Pb, Zn
  - Screening to estimate metals leached from media under batch and flow-through conditions

- **Toxicity**
  - 48 hour – Daphnia Survival
  - Screening to evaluate potential impacts of surface water exposed to WTR media.

**WTR Results**

**Infiltration Rates**

- Mix 24
  - 50% 3/8" Crushed Rock, 25% C-33 Sand, 25% WTR 2 – 5 mm

**Maximum Sorption**

**Kinetic Sorption**

**Dissolved Metals**

**Toxicity**

100% Survival of all Daphnia in all Samples

**Field Testing Site**

Field site located at Wapato Lake,

Water collected from Eastern stormwater conveyance system

Stormwater is dosed into the treatment columns through an automated pump system which is activated when the water level rises in the conveyance

**Conclusion**

Water Treatment Residual (WTR) is a waste product of the drinking water treatment process that can be expensive to dispose of. By finding a way to Recycle and Re-use this material we can fight phosphorus without spending a lot of money.

WTR’s can be used as an effective alternative stormwater management tool that can both reduce the waste stream to our landfills and the cost to our utilities while protecting our freshwater systems.

**References**


